83664

Production and Some Properties of Neodymium Hexaboride

S/073/60/026/004/002/008
B016/B054

ASSOCIATION: Institut metallokeramiki i spetssplavov AN USSR (Institute of Powder Metallurgy and Special Alloys of the AS UkrSSR)

SUBMITTED: March 13, 1959

X

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83665

S/073/60/026/004/003/008
B016/B054

17.4311
15.2142 only 2308

AUTHORS: Samsonov, G. V. and Radzikovskaya, S. V.

TITLE: A Vacuum-thermal Method of Producing Cerium Monosulfide

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, 1960, Vol. 26, No. 4, pp. 412-417

TEXT: The authors wanted to find simpler and more reliable methods of producing cerium monosulfide, and define more precisely the conditions for producing cerium sesquisulfide on the basis of methods described in Refs. 3 and 4. To produce Ce_2S_3, they studied the sulfidation of CeO_2 by dry H_2S between 600 and 1300°C. The method of producing the initial substances is described. Weighed samples of CeO_2, or of mixtures of CeO_2 and S or carbon black, were heated in a resistance furnace in a continuous H_2S current. The H_2S was previously dried with calcium chloride and phosphoric anhydride. The sulfidation products were also cooled in the H_2S current; the content of cerium, sulfide-, and free sulfur was

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A Vacuum-thermal Method of Producing Cerium Monosulfide

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subsequently determined. The methods of analysis are described. Table 1 and Fig. 1 show the results of direct sulfidation without the addition of reducing agents. The products obtained melt at higher temperatures (1400-1500°C). This is probably due to the formation of eutectic mixtures of various cerium sulfides, and to the reaction of sesquisulfide with the procelain of the vessel. The data indicate that a sufficiently complete reduction of cerium oxide takes place at 900°C. A further increase in temperature does practically not influence the composition of the reaction product. The use of coal as a reducing agent offers no advantages as compared with direct sulfidation. Further, the authors used the presumable reactions of Ce_2S_3 with CeO_2 to study the production conditions of CeS from Ce_2S_3. Table 2 shows the results of chemical analyses of the products prepared in vacuo at 1200-1600°C. Hence, it appears that the reaction $2Ce_2S_3+CeO_2$ does not proceed in the direction expected (with simultaneous formation of SO_2) but in the direction of the formation of a mixture of oxysulfides with Ce_2S_3. The reaction $Ce_2S_3 + CeO_2 + Si$ in vacuo does not yield any products free from oxygen either. Besides, they

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are contaminated by silicon. By means of the reaction (3) $Ce_2S_3 + CeO_2 + C = 3CeS + 2CO$ (Tables 3, 4, Fig. 2), a product was obtained whose content of bound Ce and S is close to that of the monosulfide; the product is, however, strongly contaminated by carbon and oxygen. Table 5 shows results of the purification of the product by the addition of Ce_2S_3 and by heating it again to 1650-1700°C. An addition of 70% of Ce_2S_3 is sufficient to obtain the purest products. There are 2 figures, 5 tables, and 6 references: 3 Soviet, 2 US, and 1 French.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN USSR (Institute of Powder Metallurgy and Special Alloys of the AS UkrSSR)

SUBMITTED: January 5, 1950

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S/032/60/026/05/42/063
B010/B008

AUTHORS: Vereykina, L. L., Rudenko, V. N., Samsonov, G. V.

TITLE: Device for the Determination of the Ultimate Compressive Strength on Samples of Difficultly Fusible Compounds at High Temperatures

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 5, pp. 620-621

TEXT: The determinations mentioned in the title were carried out on a 30 t testing machine with a device described by V. G. Osipov (Ref. 1). The device (Fig. 1) was slightly modified by displacing the heating element and making it from VKZ-alloy. The heating of the sample is carried out by having the electric current passed directly through the heating element and the sample. If the tests are made at temperatures so high that oxidation takes place, a hollow ring is used and argon blown through. The ultimate compressive strength of titanium carbide, titanium boride, zirconium boride, chromium boride, and molybdenum disilide was carried out on samples which were obtained by hot pressing of the powders in graphite molds (Ref. 2). A diagram (Fig. 3) of the

Device for the Determination of the Ultimate Compressive Strength on Samples of Difficultly Fusible Compounds at High Temperatures

S/032/60/026/05/42/063
B010/B008

dependence of the ultimate compressive strength of the investigated, difficultly fusible compounds on the temperature is given. There are 3 figures and 3 Soviet references.

B

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences of the UkrSSR)

Card 2/2

5.2100,5.2200

78209
SOV/80-33-3-10/47

AUTHORS: Samsonov, G. V., Serebryakova, T. I.

TITLE: Preparation of Borides of Group IIA Metals

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 3, pp 563-569 (USSR)

ABSTRACT: Borides of alkaline earth metals were obtained by the following methods: (a) Reduction of the metal oxides with boron carbides under vacuum; (b) combining boron directly with beryllium or magnesium; (c) reduction of the metal oxides with boron under vacuum. The laboratory vacuum oven with graphite heating element and the resistance oven used in (b) were described previously (ZL, 1953, Vol 19, p 243; ZhNKh, 1959, Vol 4, p 2759). The composition of the oven charges and the conditions of the reaction are given in Table 1. Methods (a), (b), and (c) applied to the Be-B system gave predominantly Be_2B, and also BeB_4 which had the tetragonal structure analogous to that of UB_4, as well as BeB_6 whose

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structure was not quite clear but definitely different from the structure of the hexaborides of Ca, Sr, and Ba. BeB_6 was obtained with methods (b) and (c) but not with method (a). The reduction of MgO with boron under vacuum at 1,300° C gave a boride close to MgB_4 (67.5% B found, as compared with 64% B calculated). A boride MgB_6 (75.5% B found, 72.8% B calculated) formed at 1,400° C. As to hexaborides of Ca, Sr, and Ba, the highest yield was obtained in reactions 10, 13, 14 at 1,600° C, 1,600° C, and 1,500° C, respectively. The hexaborides thus obtained had a practically stoichiometric composition. There are 3 tables; 3 figures; and 13 references, 1 French, 1 Danish, 11 Soviet.

ASSOCIATION: Institute of Metalloceramics and Special Alloys, Academy of Sciences USSR (Institut metallokeramini i spetsial'nykh splavov AN USSR)

SUBMITTED: August 24, 1959

Card ~~2/3~~

2/2

15. 2200

78211
SOV/80-33-3-12/47

AUTHORS: Portnoy, K. I., Samsonov, G. V., Frolova, K. I.

TITLE: Concerning Some Properties of Boron Carbide Alloys With Titanium Boride and With Titanium-Chromium Boride

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 3, pp 577-582 (USSR)

ABSTRACT: Samples of the above alloys were prepared by pressing the powdered carbide and borides at 2,100-2,400° C for 10 to 15 minutes, after which their structure, phase composition, microhardness, and resistance to oxidation were determined. The results are given in Tables 1, 2, and 3. It was concluded that these alloys are not sufficiently heat resistant except for short-term service. There are 3 tables; 4 figures; and 5 references, 4 Soviet, 1 U.S. The U.S. reference is: F. Glaser, J. Metals, 4, 391 (1952).

SUBMITTED: November 11, 1958

Card 1/

80102

5.2100 S/080/60/033/04/13/045

AUTHORS: Funke, V.F., Yudkovskiy, S.I., Samsonov, G.V.

TITLE: Some Peculiarities of the Vacuum-Thermal Manufacture of Titanium Boride

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 4, pp 831 - 835

TEXT: The effect of a charge increase on the condition of obtaining titanium diboride and also the content of impurities in the initial materials on the purity and the composition of boride is investigated here. Titanium diboride is formed by the reaction $2TiO_2 + B_4C + 3C \rightleftarrows 2TiB_2 + 4CO$. The initial materials were commercial titanium dioxide which contained (%) 59.65 Ti, 0.11 Fe_2O_3, 0.16 Al_2O_3, calcium, magnesium and boron carbide powder with 220 mesh. The reaction was carried out in a TVV-2 furnace with a graphite heater. It has been shown that the temperature and the holding time must be increased in order to obtain titanium boride of stoichiometric composition with a low content of carbon, if the charge is increased from 10 - 20 g to 100 - 200 g. At 1,400 - 1,500°C and a holding time of 2 - 3 hours titanium boride contains up to 1% carbon. At a temperature of 1,700°C and a holding time of 3 hours the titanium boride has a stoichiometric composition and the carbon content is only 0.26%. The higher is the content of carbon in the form of carbide, the less carbon must be introduced in the

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80604

S/080/60/033/005/001/008

24.7700

AUTHORS: Neshpor, V.S., Samsonov, G.V.

TITLE: The Investigation of the Conditions for the Silicon-Thermal Production of Lanthanum Silicide and Some of Its Properties

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, No 5, pp 993 - 1001

TEXT: The condition of obtaining $LaSi_2$ by reduction of the metal oxide with silicon was studied by the strain gauge method, developed earlier by one of the authors [Refs 2, 3], for application to carbides and borides of transitional metals. Mixtures of lanthanum and silicon oxide powders were subjected to heating in the vacuum at temperatures from 1,200 to 1,600°C. A temperature increase beyond 1,600°C causes melting and volatilization of the reaction products. At lower temperatures LaSi is formed which reacts with an excess of silicon and is partially transformed to $LaSi_2$. At higher temperatures La_2O_3 is directly reduced to disilicide. Lanthanum disilicide in the form of a practically one-phase product is obtained at 1,500°C and at an initial vacuum of 10^{-3} mm Hg in the furnace. The approximate values of the formation heats of lanthanum mono-

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80604

S/080/60/033/005/001/008

The Investigation of the Conditions for the Silicon-Thermal Production of Lanthanum Silicide and Some of Its Properties

and disilicide are 64 and 52 kcal/mole, respectively, which is similar to the formation heat of $CeSi_2$. The microhardness of $LaSi_2$ is 324 kg/mm^2, which is lower than the microhardness of the disilicides of the transitional metals of the groups IV-III of the Periodic System, as well as that of pure silicon. There are, however, some sections of the phase with a gray color, having a microhardness of 626 kg/mm^2. The low microhardness is due to the loosening effect of lanthanum atoms enclosed in the empty spaces of the three-dimensional lattice of the bonds between the silicon atoms. The absolute thermo-emf is negative in the temperature range investigated and passes through a minimum at 500 - 600°C. Hall's constant of $LaSi_2$ at room temperature is negative and has a value of $17.5 \cdot 10^{-5}$ cm^3/coulomb.
There are: 6 graphs, 1 diagram, 2 tables and 15 references; 11 Soviet, 2 English, 1 American and 1 German.

SUBMITTED: August 9, 1959

Card 2/2

82562

5.1310

S/080/60/033/06/03/006

AUTHORS: Samsonov, G. V., Obolonchik, V. A., Kulichkina, G. N.

TITLE: The Problem of the Electrolytic Method of Obtaining Elemental Boron

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 6, pp. 1365-1368

TEXT: The possibility of obtaining elemental boron by the process indicated in (Ref. 7) was again studied and some preliminary data were published. The electrolysis was carried out in a graphite crucible 56 mm in diameter and 95 mm high. A mixture was made of the powder-like initial salts with the ratio KCl : KBF_4 = 5 : 1 based on the weight. In the case of using a Cu electrode, only 0.3 - 0.4% of Cu are found in the cathode product, whereas with iron and Mo electrodes this percentage is considerably higher. It was found that by the process described in (Ref.7) elemental boron with a purity of no more than 93% can be obtained. A repeated use of the graphite crycible reduces the carbon content in the cathode deposit considerably. The carbon content in boron, being in the first electrolysis 6.82% decreases to 0.55% after repeated electrolysis. An increase in the temperature of the process leads to a decrease of the cathode current yield. It is probable that the current yield obtained at 1-5 amp/dm^2 is close to the maximum which can be attained under the given

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The Problem of the Electrolytic Method of Obtaining Elemental Boron

conditions. In the electrolysis of molten KBF_4 (without KCl) boron with a purity of 99% can be obtained, but with a very low boron yield. A. I. Kashtanov took part in the experimental part of the work. There are 2 graphs, 1 table, 1 diagram and 10 references: 2 Soviet, 3 French, 2 American, 2 English and 1 German.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN UkrSSR (Institute of Metal Ceramics and Special Alloys of the AS UkrSSR)

SUBMITTED: July 30, 1959

27516
S/080/60/033/006/032/041/XX
D213/D302

5.2200

AUTHORS: Antonova, M.M., and Samsonov, G.V.

TITLE: Synthesis of vanadium hydride

PERIODICAL: Zhurnal prikladnoy khimii, v. 33, no. 6, 1960, 1407 - 1408

TEXT: The authors studied the method of preparing vanadium hydride by heating powdered vanadium metal in a hydrogen atmosphere. The method of preparation is then described. The results show that the most favorable conditions are at 800°C at a 2 hour reaction time. The maximum adsorption at each temperature occurs at this interval, but over 900°C the hydride begins to decompose to H_2. The extent of absorption under optimum conditions is 1.76 % which corresponds to the composition VH, i.e. a monohydride. X-ray analysis shows tetragonal lattices with periods a = 2.990 and c = 3.395 kX which is in good agreement with data by U. Rostoker, who for the hydride gave $VH_{0.94}$, a = 3.013, c = 3.352 kX (Ref. 9: Metallurgiya vanadi-

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Synthesis of vanadium hydride

S/080/60/033/006/032/041/XX
D213/D302

ya, ILM. 1959). The phase VH starts to form in a solid solution containing 0.47 %, but X-ray analysis of the crystal lattice does not show the presence of VH until the stoichiometric amount of H_2 has been absorbed. Otherwise, a solid solution is formed containing hydrogen in vanadium and vanadium hydride. Calculation from available information put the activation energy of the hydrogenation of vanadium at 1430 cal/mole which is significantly lower then the corresponding value for NbH. This difference is attributed to the different electron acceptor properties of the vacant d orbitals in the vanadium and niobium atoms respectively which are more accentuated in the vanadium. This accounts for the greater ease of formation of VH than NbH. The method described can be used on an industrial scale as well as in laboratories. There are 1 figure and 10 references: 4 Soviet-bloc and 6 non-Soviet-bloc. The reference to the English-language publication reads as follows: D. Smith, Hydrogen in Metals, Univ. of Chicago Press. Chicago, 11, 1948.

SUBMITTED: November 23, 1959

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82670

S/080/60/033/007/017/020
A003/A001

5.2200A

AUTHORS: Samsonov, G. V., Kosolapova, T. Ya., Paderno, V. N.

TITLE: The Preparation of Thorium Carbides

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 7, pp. 1661-1664

TEXT: Thorium carbides, especially ThC_2, are initial materials for cathodes in electronic engineering. A ThC_2 cathode operates steadily at 1,900°C for 900 hours. The conditions for obtaining pure ThC and ThC_2 by the reactions: $ThO_2 + 3C = ThC + 2CO$; $ThO_2 + 4C = ThC_2 + 2CO$; were studied. Briquettes of the corresponding stoichiometric charges were heated in the vacuum furnace at temperatures from 1,000 to 1,900°C. At temperatures below 1,450°C a product containing a large excess of free carbon is formed. The optimum conditions for obtaining pure ThC are heating of the briquettes at a temperature of 1,800-1,900° C and an initial pressure of $2-3 \cdot 10^{-2}$ mm Hg for 2 hours. The formation of dicarbide starts at 1,400°C. The optimum conditions for ThC_2 preparation are heating at a temperature of 1,800-1,850°C and an initial pressure of $2-3 \cdot 10^{-2}$ mm Hg. The heating time for briquettes of 15-20 g is 2 hours. It was shown

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The Preparation of Thorium Carbides

that thorium carbides are easily soluble in water, diluted acids and alkali solutions. There are 2 graphs, 3 tables and 5 references: 4 Soviet and 1 American.

SUBMITTED: December 15, 1959

IX

82676
S/080/60/033/008/002/013
A003/A001

5 2200

AUTHORS: Kosolapova, T.Ya., Samsonov, G.V.

TITLE: The Preparation of Lower Chromium Carbide

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 8, pp. 1704-1708

TEXT: In the chromium-carbon system there are three carbides of the following composition: Cr_3C_2, Cr_7C_3 and $Cr_{23}C_6$. The first two carbides were investigated in Refs. 1, 2. The conditions for obtaining $Cr_{23}C_6$ by reduction of chromium oxide with carbon in an atmosphere of hydrogen and in a vacuum according to the reaction $23C_2O_3+81C=2Cr_{23}C_6+69CO$ was investigated, as well as the direct reaction between chromium and carbon. The experiments were made with briquets of stoichiometric composition at temperatures from 1,000 to 1,500°C. It was shown that the carbide formation sets in at 1,100°C. Already at 1,150°C a product is obtained which contains more carbon than $Cr_{23}C_6$, i.e., which contains also higher carbides. The preparation of $Cr_{23}C_6$ under the conditions mentioned proved to be impossible. Roentgen-analysis showed also a high content of higher carbides in the reaction products obtained at 1,100 and 1,200°C. The reduction of the carbon content in the mixture led to the formation of products containing a considerable amount of nitrogen and oxygen. This is explained by defects in the structure of $Cr_{23}C_6$. The

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82676
S/080/60/033/008/002/013
A003/A001

The Preparation of Lower Chromium Carbide

carbide desired can be obtained by sintering a powder mixture of chromium and carbon black of calculated composition in graphite press-dies, using hot pressing in an atmosphere of argon. The sintering is carried out at 1,200-1,300°C, holding the powder mixture for 15 min under a pressure of 160 kg/cm^2. The products obtained have the following composition (%): Cr=92-92.5, C_{bound}=5.7-5.9, C_{free}-traces, N=0.6-0.8, O-up to 0.8. There are 4 tables and 4 Soviet references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN UkrSSR
(Institute of Metal Ceramics and Special Alloys of the AS UkrSSR)

SUBMITTED: October 31, 1959

Card 2/2

82519

S/020/60/133/04/17/031
B019/B060

24.7700

AUTHORS: Neshpor, V. S., Samsonov, G. V.

TITLE: Electric, Thermoelectric, and Galvanomagnetic Properties of Silicides of Transition Metals

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 4, pp. 817-820

TEXT: The authors studied the electric resistivity, the thermo-emf, and the Hall effect of silicides of a number of transition metals from group IV to VII of the periodic system, as well as of lanthanum, cerium, and praseodymium. Fig. 1 shows graphically the electric resistivity of the silicides as a function of the silicon atom content. Depending on the character of this function the authors divide silicides into two groups: the first group comprises the silicides of Ti, Zr, V, Ta, W, and Mo, in which the resistance of the intermediate phases drops with increasing Si content. The second group includes the silicides of Cr, Fe, Re, Mn, in which the electric resistivity of the intermediate phases rises with increasing Si content. The silicides of the first group

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Electric, Thermoelectric, and Galvanomagnetic Properties of Silicides of Transition Metals

S/020/60/133/04/17/031
B019/B060

have metallic conductivity, and those of the second group possess semiconductor properties, such as a negative temperature coefficient of electric resistivity and a high thermo-emf. The respective values are tabulated in Table 1. The character of the interatomic bond in the two groups is inferred. It was found by measuring the Hall constants and the thermo-emf coefficients that silicides, unlike transition metals which essentially possess p-type conductivity, with the exception of molybdenum and tungsten disilicides, possess n-type conductivity, just like borides (Ref. 7) as well as carbides and nitrides in titanium compounds. Details of the conductivity and of the magnetic properties are discussed, and the specific character of electron motion in the semiconductor is dealt with. Most of the measurements were conducted by the authors with the aid of apparatus belonging to the Chair of Physics at the Khersonskiy pedagogicheskiy institut (Kherson Pedagogical Institute) with the assistance of S. N. L'vov, V. F. Nemchenko, and A. Ya. Kuchmy. The authors express their gratitude to the aforementioned persons for their help. There are 2 figures, 1 table, and 16 references: 11 Soviet, 1 Australian, 2 US, and 2 German.

82519

Electric, Thermoelectric, and Galvanomagnetic Properties of Silicides of Transition Metals

S/020/60/133/04/17/031
B019/B060

ASSOCIATION: Institut metallokeramiki i spetsial'nykh spalvov Akademii nauk SSSR (Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences, USSR)

PRESENTED: March 25, 1960, by S. A. Vekshinskiy, Academician

SUBMITTED: February 30, 1960

Card 3/3 .

84703

15.2142

S/020/60/133/006/006/016
B016/B060

AUTHOR: Samsonov, G. V.

TITLE: Preparation and Properties of Scandium Diboride

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 6, pp. 1344-1346

TEXT: The author compared the physical properties of scandium compounds with those belonging to compounds of other transition metals of the 1st period, and especially with the properties of boron compounds. The author had previously prepared ScB_2 samples by separating them from boron carbide according to the specific gravity in heavy liquids. N. N. Zhuravlev and A. A. Stepanova (Ref. 2) studied these preparations and determined the crystalline structure of ScB_2 which proved to be hexagonal (structural type of AlB_2). It is the same as that of diborides of other transition metals of groups IV - VI of the periodic system, among them titanium-, vanadium-, and chromium diborides. In a later work and with the assistance of B. M. Tsarev, G. A. Kudintseva, and V. S.

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84703

Preparation and Properties of Scandium Diboride

S/020/60/133/006/006/016
B016/B060

Neshpor, the author tried to determine the principal parameters of the thermoelectron emission of ScB_2. X-ray analysis revealed that ScB_2 lost part of the metal when it was heated in vacuum, and was converted to scandium hexaboride which exhibits a cubic lattice. In the present paper, the author systematically examined the conditions of preparing ScB_2 on the basis of the reaction between Sc_2O_3 and boron in vacuum. A lower, volatile boron oxide (BO or B_2O_2) was separated: $Sc_2O_3 + 7B = 2ScB_2 + 3BO$. The author found that the reaction had its best course at 1800-1850°C. If the reaction mixture is kept at this temperature for 1 h, the product will contain 32.6% of boron (32.5% was determined in ScB_2). For determining the physical properties of ScB_2, samples were prepared from the powder by hot-pressing at 2000-2050°C. Table 1 supplies several physical data of ScB_2, TiB_2, VB_2, and CrB_2, which are then compared with one another. The author mentions O. I. Shulishova who assisted in the experiments. There are 1 figure, 1 table, and 7 Soviet references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk USSR (Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences UkrSSR)

Card 2/3

64703

Preparation and Properties of Scandium Diboride

S/020/60/133/006/006/016
B016/B060

PRESENTED: April 7, 1960, by I. I. Chernyayev, Academician

SUBMITTED: April 5, 1960

Card 3/3

86037
S/020/60/135/003/019/039
B019/B077

24.7700 (1043,1143,1559)

AUTHORS: L'vov, S. N., Nemchenko, V. F., and Samsonov, G. V.

TITLE: Some Principles of Electrical Properties of Borides, Carbides, and Nitrides of Transition Metals of the IV-VI Groups of the Periodic Table

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 3, pp. 577-580

TEXT: The authors conducted measurements of the Hall coefficient, the thermo-emf, and the resistivity of monocarbides, nitrides, and some diborides of the transition metals of the IV-VI groups of the periodic table. The results are shown in Table 1. Using these experimental results the authors calculated the magnitude of $\delta = n_- u_-^2 - n_+ u_+^2$ which is characteristic of the conductivity type. δ is positive in nearly all metal compositions investigated; and this is a proof of the n-type conductivity of these compounds. From the increase of δ during the transition of metals of the IV group to the following group the influence of the electron structure of the metal on the electric properties of the compound is

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Some Principles of Electrical Properties of Borides, Carbides, and Nitrides of Transition Metals of the IV-VI Groups of the Periodic Table

S/020/60/135/003/019/039
B019/B077

studied thoroughly. This influence is found to be very strong. The authors are convinced of the periodic change of the properties of the substances in the metal-boride-carbide-nitride series that the influence of the electronic structure of the metalloid atoms strongly affects the properties of the phases. Legend to Table 1: 1) metal, phase, 2) Hall constant, 3) $\delta \cdot 10^{-23}$ in cm/v^2sec^2, 4) resistivity ρ in μohm·cm, 5) thermo-emf in $\mu v/deg$. n_- and n_+ are the concentrations and u_-, u_+ the mobilities of the electrons. There are 1 table and 18 references: 10 Soviet, 3 German and 5 US.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk SSSR (Institute of Powder Metallurgy and Special Alloys, Academy of Sciences, USSR). Khersonskiy pedagogicheskiy institut im. N. K. Krupskoy (Kherson Pedagogical Institute

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86037

Some Principles of Electrical Properties of Borides, Carbides, and Nitrides of Transition Metals of the IV-VI Groups of the Periodic Table

S/020/60/135/003/019/039
B019/B077

imeni N. K. Krupskaya)

PRESENTED: June 16, 1960, by G. V. Kurdyumov, Academician

SUBMITTED: June 13, 1960

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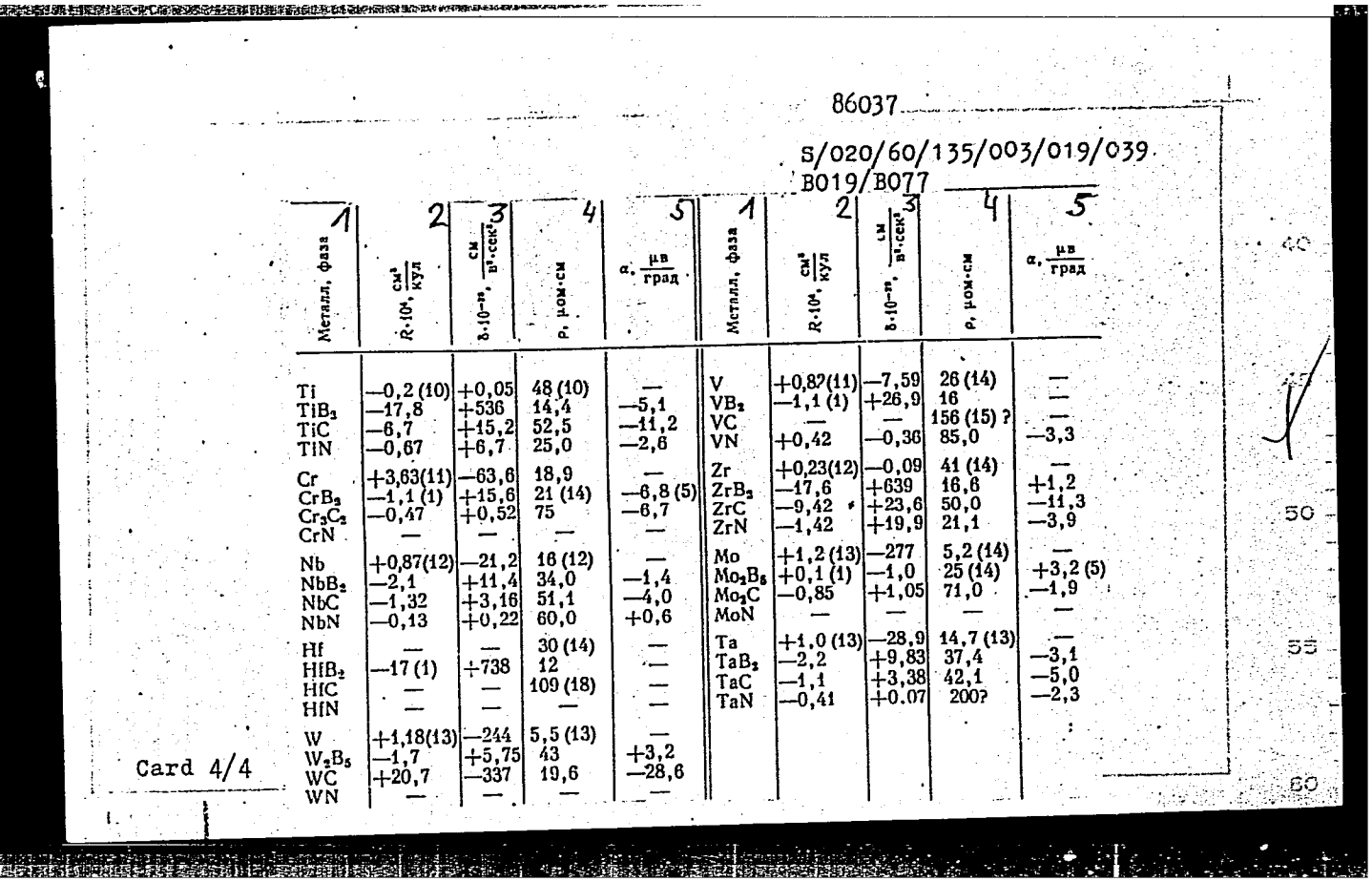

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B019/B077

1 Металл, фаза	2 $R \cdot 10^4$, $\frac{см^3}{кул}$	3 $\delta \cdot 10^{-23}$, $\frac{см}{в \cdot сек^2}$	4 ρ, мком·см	5 α, $\frac{мв}{град}$	1 Металл, фаза	2 $R \cdot 10^4$, $\frac{см^3}{кул}$	3 $\delta \cdot 10^{-23}$, $\frac{см}{в \cdot сек^2}$	4 ρ, мком·см	5 α, $\frac{мв}{град}$
Ti	−0,2 (10)	+0,05	48 (10)	—	V	+0,87(11)	−7,59	26 (14)	—
TiB_2	−17,8	+536	14,4	−5,1	VB_2	−1,1 (1)	+26,9	16	—
TiC	−6,7	+15,2	52,5	−11,2	VC	—	—	156 (15) ?	—
TiN	−0,67	+6,7	25,0	−2,6	VN	+0,42	−0,36	85,0	−3,3
Cr	+3,63(11)	−63,6	18,9	—	Zr	+0,23(12)	−0,09	41 (14)	—
CrB_2	−1,1 (1)	+15,6	21 (14)	−6,8 (5)	ZrB_2	−17,6	+639	16,6	+1,2
Cr_3C_2	−0,47	+0,52	75	−6,7	ZrC	−9,42	+23,6	50,0	−11,3
CrN	—	—	—	—	ZrN	−1,42	+19,9	21,1	−3,9
Nb	+0,87(12)	−21,2	16 (12)	—	Mo	+1,2 (13)	−277	5,2 (14)	—
NbB_2	−2,1	+11,4	34,0	−1,4	Mo_2B_5	+0,1 (1)	−1,0	25 (14)	+3,2 (5)
NbC	−1,32	+3,16	51,1	−4,0	Mo_2C	−0,85	+1,05	71,0	−1,9
NbN	−0,13	+0,22	60,0	+0,6	MoN	—	—	—	—
Hf	—	—	30 (14)	—	Ta	+1,0 (13)	−28,9	14,7 (13)	—
HfB_2	−17 (1)	+738	12	—	TaB_2	−2,2	+9,83	37,4	−3,1
HfC	—	—	109 (18)	—	TaC	−1,1	+3,38	42,1	−5,0
HfN	—	—	—	—	TaN	−0,41	+0.07	200?	−2,3
W	+1,18(13)	−244	5,5 (13)	—					
W_2B_5	−1,7	+5,75	43	+3,2					
WC	+20,7	−337	19,6	−28,6					
WN	—	—	—	—					

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83553

S/020/60/134/001/004/021
B019/B060

24.7600 also 2308

AUTHORS: Vaynshteyn, E. Ye., Zhurakovskiy, Ye. A., Neshpor, V. S., Samsonov, G. V.

TITLE: The Fine Structure of X-Ray K-Absorption Spectra and the Hall Effect in Vanadium Silicides

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 1, pp. 68-70

TEXT: The authors studied the fine structure of X-ray K-absorption spectra of vanadium and its silicides V_3Si, V_5Si_3, and VSi_2. The crystal structure of these compounds and the production of silicides are discussed in the introduction. The free silicon content in silicides did not exceed 0.6%. The apparatus has already been described. Fig. 1 shows the fine structures of the K-absorption edges of vanadium, its above-mentioned silicides, and V_2O_5. The Hall effect of these three silicides and vanadium was likewise determined. In accordance with the n-type conductivity of the silicides they possess a negative Hall

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The Fine Structure of X-Ray K-Absorption Spectra and the Hall Effect in Vanadium Silicides

S/020/60/134/001/004/021
B019/B060

constant, while metallic vanadium, in accordance with its p-type conductivity, has a positive Hall constant. The effective carrier concentration n* and its Hall mobility were determined with the aid of the Hall constants obtained. Results are compiled in Table 1. As may be seen from Fig. 1, the K-absorption edge undergoes a considerable and regular alteration in the case of increasing silicon content. Only that point of the edge remains unchanged, which characterizes the position of the original absorption range in the energy spectrum. The absorption maximum shifts toward higher energies on a transition of metallic vanadium to the silicides with rising Si content, and on a further transition to V_2O_5. Owing to the invariable position of the original absorption range, the shift of the maximum leads to a widening of the edge and, hence, causes the "mean point" of the K-edge to shift toward shorter wavelengths. With increasing Si content the width of the K-edge approaches that of V_2O_5, which is a compound with a large part of ionic bond. This indicates a polarization of the metal atoms in the silicon-rich silicides and a heteropolar component in metal-silicon compounds.

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The Fine Structure of X-Ray K-Absorption Spectra and the Hall Effect in Vanadium Silicides

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This is in good agreement with results obtained from a quantum-mechanical calculation of the energy spectrum of electrons for molybdenum disilicide (Ref. 9). The authors finally discuss the behavior of the ultra-longwave absorption maximum A (Fig. 1), which is connected with the transition of K-electrons in the region of hybridized 3d-states of transition metal atoms. The authors believe that the shift of absorption maximum A is related to the d-states perturbed by the surrounding silicon atoms. There are 1 figure, 1 table, and 10 references: 6 Soviet, 2 German, 1 US, and 1 British.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov Akademii nauk SSSR (Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences USSR). Institut geokhimii i analiticheskoy khimii im. V. I. Vernadskogo Akademii nauk SSSR (Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy of the Academy of Sciences USSR)

Card 3/4

83553

The Fine Structure of X-Ray K-Absorption Spectra and the Hall Effect in Vanadium Silicides

S/020/60/134/001/004/021
B019/B060

4

PRESENTED: April 29, 1960, by A. P. Vinogradov, Academician

SUBMITTED: April 29, 1960

Card 4/4

NESHPOR, V.S.; SAMSONOV, G.V.

Study of the Hall effect in transition metal silicides. Dokl. AN SSSR 134 no.6:1337-1338 O '60. (MIRA 13:10)

1. Institut metallokeramiki i spetsial'nykh splavov AN USSR. Predstavleno akademikom S.A.Vekshinskim.
(Transition metal silicides) (Hall effect)

FOMENKO, Vadim Stepanovich; SAMSONOV, G.V., red.; LIBERMAN, T.R., tekhn. red.

[Emissivity of elements and chemical compounds; handbook] Emissionnye svoistva elementov i khimicheskikh soedinenii; spravochnik. Pod red. G.V.Samsonova. Kiev, Izd-vo Akad. nauk USSR, 1961. 48 p. (MIRA 15:3)

1. Chlen-korrespondent Akademii nauk USSR (for Samsonov).
(Radiation)

GRIGOR'YEVA, Vera Vsevolodovna [Hryhor'ieva, V.V.]; KLIMENKO, Viktor Nikolayevich [Klymenko, V.M.]; SAMSONOV, G.V., doktor tekhn. nauk, otv. red.; KISINA, I.V., red. izd-va; LIBERMAN, T.R., tekhn. red.

[Chromium carbide base alloys] Splavy na osnovi karbidu khromu. Kyiv, Vyd-vo Akad. nauk URSR, 1961. 54 p. (MIRA 14:7)
(Chromium alloys)

KHORPYAKOV, Orfey Trofimovich; PADERNO, Yuriy Borisovich; DZEGANOVSKIY, Badim Petrovich [Dzehanovs'kyi, V.P.]; SAMSONOV, G.V.[Samsonov, H.V.], red.; YEFIMOVA, M.I. [IEfimova, M.I.], tekhn. red.

[Standard X-ray patterns of hard and high-melting alloys] Etalonni rentgenogramy tverdykh i tuhoplavkykh spoluk. Pod red. H.V.Samsonova. Kyiv, Vyd-vo Akad.nauk URSR, 1961. 62 p. (MIRA 15:2)

1. Chlen-korrespondent Akademii nauk USSR (for Samsonov). (Alloys—Metallography) (Intermetallic compounds) (Ceramic-metals—Metallography)

PHASE I BOOK EXPLOITATION SOV/5758

Samsonov, Grigoriy Valentinovich, and Yuriy Borisovich Paderno

Boridy redkozemel'nykh metallov (Borides of Rare-Earth Metals) Kiyev, Izd-vo AN UkrsSSR, 1961. 92 p. 1500 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov.

Resp. Ed.: I. N. Frantsevich, Corresponding Member, Academy of Sciences UkrSSR; Ed. of Publishing House: I. V. Kisina; Tech. Ed.: T. R. Liberman.

PURPOSE: This booklet is intended for scientific workers and engineers concerned with cathode electronics, high-power electronic devices, and the synthesis of refractory compounds.

Card [redacted]

Borides of Rare-Earth Metals SOV/5758

COVERAGE: The booklet deals with the physical and chemical properties, production methods, and the fields of application of borides of metals of Subgroups IIa and IIIa of the periodic table. The authors state that borides, particularly those of alkali and rare-earth metals and actinides, which belong to the category of refractory compounds, have not as yet been adequately studied. Borides can be utilized as cathode material for high-power electronic devices; also, investigation of their properties is of interest for the development of the theory of the physical properties of refractory compounds. The authors thank the staff of the Vrŝovice Plant in Czechoslovakia; Dr. B. Aronson (Sweden); B. M. Tsarev, Professor; and G. A. Kudintseva, for their help. They also thank the staffs of Institut fiziki AN USSR (Institute of Physics, AS UkrSSR) and of the Institut Elektrosvarki im. Ye. O. Patona, (Electric Welding Institute imeni Ye. O. Patona, AS UkrSSR) for conducting certain tests. There are 162 references, mostly non-Soviet.

Card 2/4

SAMSONOV, G.V. [Samsonov, H.V.], glav. red.;PILIPENKO,A.T. [Pylypenko, A.T.], glav. red.; NAZARCHUK, T.M., glav. red.; REMENNIK, T.K., red.; SKLYAROVA, V.Ye. [Sklyarova, V.IE.], tekhn. red.

[Analysis of hard high-melting compounds] Analiz tverdykh tuhoplavkykh spoluk. Pod zahal'noiu red. H.V.Samsonova, A.T.Pylypenka i T.M.Nazarchuk. Kyiv, 1961. 195 p. (MIRA 14:9)

1. Akademiya nauk URSR, Kiev. Instytut metalokeramiky i spetsial'nykh splaviv.
(Carbides--Analysis) (Nitrides--Analysis) (Borides--Analysis)

PHASE I BOOK EXPLOITATION SOV/6032

Yeremenko, V. N., Resp. Ed.; I. N. Frantsevich, G. V. Samsonov, I. M. Fedorchenko, G. S. Pisarenko, V. V. Grigor'yeva, and V. I. Nizhenko, eds.

Poverkhnostnyye yavleniya v metallakh i splavakh i ikh rol' v protsessakh poroshkovoy metallurgii (Surface Phenomena in Metals and Alloys and Their Role in Powder-Metallurgy Processes) Kiyev, Izd-vo AN USSR, 1961. 213 p. 1710 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov.

Ed. of Publishing House: Z. S. Pokrovskaya; Tech. Ed.: A. M. Lisovets.

PURPOSE: This collection of articles is intended for scientific research workers, engineers specializing in metals, and metallurgists. It may also be useful to advanced students at schools of higher education.

Card 1/2

Surface Phenomena in Metals (Cont.) SOV/6032

COVERAGE: Articles of this collection discuss the role of surface phenomena in powder metallurgy processes and in processes of the strong bonding of various substances. Theoretical calculations of the surface tension of some carbides and nitrides are presented. The book also reviews modern methods for studying the surface properties of metals at high temperatures and presents data on the surface tension of refractory metals and of binary metals systems. Particular attention is given to the effect of various additions on the surface tension of metals and on the interphase tension at the boundary between metals and various refractory compounds. Data on the effect of thin metal coatings on the structural and mechanical properties of metals are also presented. No personalities are mentioned. Each article is accompanied by references, mostly Soviet.

TABLE OF CONTENTS:

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PHASE I BOOK EXPLOITATION SOV/5828

Samsonov, Grigoriy Valentinovich, and Kim Isayevich Portnoy

Splavy na osnove tugoplavkikh soyedineniy (Alloys Based on High-Melting Compounds) Moscow, Oborongiz, 1961. 303 p. Errata slip inserted. 4550 copies printed.

Reviewers: I.N. Frantsevich, Corresponding Member, Academy of Sciences USSR, N.M. Sklyarov, Doctor of Technical Sciences, Professor, and M.Yu. Bal'shin, Candidate of Technical Sciences; Ed.: M.A. Bochvar, Engineer; Ed. of Publishing House: S.I. Vinogradskaya; Tech. Ed.: V.P. Rozhin; Managing Ed.: A.S. Zaymovskaya, Engineer.

PURPOSE: This book is intended for engineers and scientific research workers in industries using refractory metals and alloys.

COVERAGE: Methods used in the search for alloys based on high-temperature melting compounds are discussed. The physicomechanical

Card 1/[illegible]2.

and chemical properties of these compounds and the processes involved in their production are also considered. Brief descriptions are given of binary and ternary refractory alloy systems of titanium, zirconium, hafnium, vanadium, niobium, tantalum, molybdenum, tungsten, thorium, and uranium with boron, carbon, nitrogen, and silicon. Alloys of various borides, carbides, nitrides, and silicides, and nonmetallic high-melting compounds are also described. Examples of the use of these alloys in industry are presented and the most important coatings based on high-melting compounds are briefly outlined. The authors thank I.N. Frantsevich, Corresponding Member of the Academy of Sciences, Ukrainian SSR, Professor N.M. Sklyarov, Doctor of Technical Sciences, and M.Yu. Bal'shin, Candidate of Technical Sciences, for their comments and assistance. There are 316 references, mostly Soviet.

FEDORCHENKO, Ivan Mikhaylovich; ANDRIYEVSKIY, Rostislav Aleksandrovich; BAL'SHIN, M.Yu., kand. tekhn.nauk, retsenzent; BOROK, B.A., kand. tekhn.nauk, retsenzent; GEGUZIN, Ya.Ye., prof., doktor fiz.-mat.nauk, retsenzent; SAMSONOV, G.V., prof., doktor tekhn.nauk, retsenzent; POKROVSKAYA, Z.S., red.; KADASHEVICH, O.A., tekhn. red.

[Principles of powder metallurgy] Osnovy poroshkovoi metallurgii. Kiev, Izd-vo Akad.nauk USSR, 1961. 420 p. (MIRA 14:12)
(Powder metallurgy)

OBOLONCHIK, Vasiliy Andreyevich [Obolonchyk, V.A.]; SAMSONOV, G.V. [Samsonov, H.V.], prof., doktor tekhn. nauk, otv. red.; LABINOVA, N.M., red.izd-va; LIBERMAN, T.R., tekhn. red.

[Rhenium] Renii. Kyiv, Vyd-vo Akad. nauk URSR, 1961. 60 p. (MIRA 15:4)

(Rhenium)

88000

S/131/61/000/001/003/004
B021/B058

15.2210 1155, 1136, 1273

AUTHORS: Samsonov, G. V., Yasinskaya, G. A., and Lapteva, E. P.

TITLE: Refractory Cerium Dioxide Products

PERIODICAL: Ogneupory, 1961, No. 1, pp. 41-42

TEXT: Experiments for the manufacture of cerium-dioxide products are described in this paper, and some of their properties are investigated. Powder and starch paste were dosed according to the formula by A. N. Novikov. The maximum firing temperature was 1400°C. The results of testing crucibles from CeO_2 for the effects of melts of various metals are tabulated. The absence of the interaction of crucibles from CeO_2 with aluminum melt was confirmed by the Laboratory of Pure Metals and Semiconductors of the Krasnoyarskiy institut tsvetnykh metallov (Krasnoyarsk Institute of Nonferrous Metals). These crucibles also proved to be stable against melts of semiconductor alloys of the type $A^{II}B^{VI}$. There are 2 figures, 1 table, and 3 Soviet references.

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Card 2/2

SAMSONOV, G. V.; PADERNO, V. N.

"Preparation and physical properties of carbide mixed crystals."

Report presented at the Conference on Powder Metallurgy, Krakow, Poland, 19-21 Sept 63.

15.2200 1273 1142, 1043

S/180/61/000/001/012/015
E021/E406

AUTHORS: Zhuravlev, N.N., Makarenko, G.N., Samsonov, G.V., Sinel'nikova, V.S. and Tsebulya, G.G. (Kiyev)

TITLE: The Question of the Properties and Phase Composition of Alloys of Boron and Carbon

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.1, pp.133-141

TEXT: The aim of the work was to find a method of preparing relatively pure alloys of boron with carbon and to investigate their physical properties and phase composition. The initial materials were powders of amorphous boron (98.5 to 99.5%) and lamp black (99.8% C). The powders were mixed in alcohol, dried and sieved through 150 mesh. Several methods of preparation were tried, the most acceptable being to hot-press a mixture of the powders in an argon atmosphere in graphite press-formers. Some carburization took place (chemical analyses were made by T.N.Nazarchuk). This could be overcome by using a molybdenum lining but it resulted in contamination with 1.3 to 1.9% molybdenum. Boron nitride linings avoided this contamination. The alloys prepared were examined metallographically, etching by anodic treatment in a

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The Question of the Properties ...

40% KOH solution at 0.9 to 1.2 A/cm^2 and 10 to 20 V. The structures obtained are shown in Fig.1. The alloy with 6.4% carbon had a eutectic structure. At about 8% carbon, the structure was practically single-phased and at 10.2% carbon the whole field appeared as a eutectic. It is proposed that a compound forms at about 8% carbon with the formula $B_{12}C$. A second compound begins to appear at about 10% carbon and is either $B_{13}C_2$ or $B_{12}C_3$. X-ray analysis of the alloys was also carried out and confirmed the metallographic observations. Fig.2 shows the photograph of the phases $B_{12}C$ and B_4C. The B_4C phase had a rhombohedral structure. Between 20.9 and 80% C, the alloy consisted of two phases: the rhombohedral phase,with maximum carbon content in the cell, and graphite. At 61% carbon, an X-ray photograph with a large number of lines, the intensity and position of which did not correspond to B_4C, was obtained. It is proposed that a compound richer in carbon than B_4C exists at high temperatures, which decomposes to B_4C and graphite at low temperatures. Micro-hardness measurements showed that in the unannealed state there is a maximum corresponding to the proposed phase $B_{12}C$ (about 6000 kg/mm^2). After annealing, the hardness curve is smoothed out and the hardness

of $B_{12}C$ was 4000 kg/mm^2 whilst that of B_4C was about 5000 kg/mm^2. Electrical resistance measurements showed that there were sharp maxima at 8 and 21.7% carbon. After annealing, the first maximum was retained although the absolute value decreased; a high maximum was observed at about 15% carbon ($B_{13}C_2$). The resistance of alloys containing more than 30% carbon was low and practically independent of composition. Studies of temperature dependence of resistance of B_4C confirmed the semiconducting character of this carbide (see Fig.5). Thermal e.m.f. measurements showed that the highest values corresponded to defect structures of the compounds $B_{12}C$ and $B_{12}C_3$ deficient in carbon. Two possible variations of the phase diagram of the boron-carbon system at the boron-rich end are given in Fig.4. There are 5 figures, 3 tables and 19 references: 14 Soviet and 5 non-Soviet.

SUBMITTED: August 24, 1960

Card 3/9

17.4311
26.2181

S/180/61/000/001/013/015
E021/E406

AUTHORS: Bolgar, A.S., Verkhoglyadova, T.S. and Samsonov, G.V.
(Kiyev)

TITLE: The Vapour Pressure and Rate of Evaporation of Several Refactory Compounds in a Vacuum at High Temperatures

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.1, pp.142-145

TEXT: The vapour pressure and rate of evaporation in a vacuum of the borides of titanium, zirconium, chromium, strontium; the carbides of titanium, zirconium, chromium; the silicides of molybdenum and the nitrides of titanium, niobium and tantalum were studied. The rate of evaporation was measured by the method of Langmuir, based on the decrease in weight of the material from unit surface in unit time. The apparatus used was based on a vacuum laboratory furnace. Measurements could be made in the range 1100 to 1900°C and the temperature was measured by an optical pyrometer. The results are given in Table 2 and in Fig.2. Table 3 gives comparative data on the change in composition when heated at 1700°C in vacuo. It can be seen that all the compounds evaporate as molecular complexes except AlB_{12} which dissociates with

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evolution of aluminium. The heats of evaporation are given in Table 4. There are 2 figures, 4 tables and 12 references: 9 Soviet and 3 English.

ASSOCIATION: Institut metallokeramiki i spetssplavov AN UkrSSR (Institute of Cermets and Special Alloys AS UkrSSR)

SUBMITTED: August 7, 1960

Caption to Table 2.

The temperature relationship of the vapour pressure (bottom line in p x 10^5 mm Hg) and rates of evaporation (top line in g/cm^2 sec) of the studied compounds.

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S/131/61/000/002/001/002
B 105/B206

15.2220 1273, 1043

AUTHORS: Samsonov, G. V., Kislyy, P. S., Panasyuk, A. D., Strel'chenko, A. G., Khavrunyak, I. G., Serikova, G. N.

TITLE: Shield tubes from zirconium boride for immersion thermocouples

PERIODICAL: Ogneupory, no. 2, 1961, 72-74

TEXT: The article describes experiments and studies leading to the manufacture of shield tubes from zirconium boride which have a high thermal resistivity. Shield tubes produced from zirconium dioxide, which withstand immersion into molten steel at 1650-1720°C for a short time, were elaborated at the Leningradskiy tekhnologicheskiy institut imeni Lensoveta (Leningrad Technological Institute imeni Lensovet). Studies of their stability in molten cast iron and steel, made at the laboratoriya tugoplavkikh materialov (Laboratory for High-melting Materials) of the Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR), showed that zirconium boride ZrB_2 is of extremely high thermal resistivity and thus well suited

Card 1/

for shield tubes of thermocouples. Such a shield tube is schematically shown in Fig. 1. The blanks of the shield tube are dried and sintered in an electric furnace at a temperature of 2050-2200°C. The sintered shield tubes have a fine-grained fracture and a porosity of 5-12%. Shield tubes with an outer diameter of 11 and 16 mm and an inner diameter 4 and 11 mm were made. They were tested at the following metallurgical plants: zavod "Zaporozhstal'" ("Zaporozhstal'" Plant), zavod im. Dzerzhinskogo (Plant imeni Dzerzhinskiy), Alchevskiy zavod (Alchevskiy Plant), as well as the Kiyev plants: zavod "Bol'shevik" ("Bol'shevik" Plant) and zavod "Leninskaya kuznitsa" ("Leninskaya kuznitsa" Plant). When testing the shield tubes in molten cast iron at 1400 to 1450°C in a Kryptol furnace, it was found that they are only slightly covered by slag and not corroded, and that they maintain their initial structure. When tested during tapping of cast iron in a blast furnace, they withstand 15 tappings with a total stay of 10 hr 53 min in molten metal. In an open-hearth furnace with basic lining, shield tubes are corroded by basic slags and destroyed after 30-40 min. The outer diameter of the shield tubes is not reduced during immersion in molten steel and a stay of

40-45 min. In small open-hearth furnaces, shield tubes withstood the total melting time (2 hr) without any damage. Their thermal resistivity is determined by the number of immersions into the tank of the open-hearth furnace and is at least 15 to 20 immersions, permitting the temperature of the steel to be regulated during the entire heating-up period. At the Kiyevskiy armaturno-mekhanicheskiy zavod (Kiyev Plant for Fittings and Mechanical Equipment), zirconium boride shield tubes withstood 86 hr in molten brass at 850 ± 50°C without any damage. At the "Leninskaya kuznitsa" Plant, the same results were obtained during a test in molten bronze of the type АМЦ-10-2 (AMTs-10-2). Besides the authors, A. G. Petrenko, Ya. S. Gayvoronskiy, N. M. Tenishev, V. G. Tishchenko, I. R. Krichker, G. G. Bespalyy, G. A. Yasinskaya, as well as collaborators of the plants mentioned participated in this study. Shield tubes from silicon nitride (Si_3N_4) also show high stability in molten brass at 850°C. The high stability of zirconium boride shield tubes in molten steels and cast iron makes it possible to use them in tanks of open-hearth furnaces, blast-furnace channels, and steel ladles. Zirconium boride shield tubes showed high stability in molten bronzes and brass. Continuous temperature measurement of metals in melting furnaces can be

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Shield tubes from zirconium boride ... S/131/61/000/002/001/002
B105/B206

made with their aid. There are 3 figures and 6 Soviet-bloc references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR) Samsonov, G. V., Kislyy, P. S., Panasyuk, A. D.; Institut avtomatiki Gosplana USSR (Institute of Automation of the Gosplan of the UkrSSR) Strel'chenko, A. G., Khavrunyak, I. G., Serikova, G. N.

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27335
S/021/61/000/002/012/013
D210/D303

AUTHORS: Radzikivs'ka, S.V., and Samsonov, G.V.

TITLE: Vacuo-thermic method of cerium and lanthanum monosulphide preparation

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 2, 1961, 209 - 212

TEXT: The subject of this investigation was to work out a method of rare earth metal monosulphide preparation, simpler than that normally used which is cumbersome and requires a complicated installation. The proposed method consists of a reaction in vacuum of a general type:

$$2Me_2S_3 + Me_2O_3 + 3C = 6MeS + 3CO.$$

Elaborating the method was carried out on Cerium and Lanthanum sulphides. The starting compounds Ce_2S_3 and La_2S_3 were obtained by

Card 1/5

Vacuo-thermic method of ...

action of dry H_2S on CeO_2 and La_2O_3 at 1000°C. It was assumed that the monosulphides formation proceeded in two stages:

$$Me_2O_3 + C \rightarrow Me + CO$$

$$Me_2S_3 + Me \rightarrow MeS$$

To elucidate this supposition the reaction of CeO_2 at 1000-1700°C with carbon was investigated. The obtained results showed that up to 1400°C the reaction proceeded very slowly, accelerating afterwards very markedly and at 1700°C the amount of reduced cerium reached almost the initially used cerium amount. [Abstractor's note: Last temperature is given in the article as 1000°C which is a mistake; the figure on which the reaction curves are drawn also is not clear: the beginning of the fast reaction is shown there at 1100°C]. The reaction of cerium monosulphide formation:

$$Ce_2S_3 + CeO_2 + 2C = 3CeS + 2CO$$

Card 2/5

Vacuo-thermic method of ...

was carried out in vacuum at 1000 - 1700°C; the reaction mixture was pressed into briquettes 8 x 10 mm and heated in a vacuum oven with a graphite heater under 10^{-1} - 10^{-2} mm pressure for an hour. The results obtained showed that at 1600-1700°C the amount of cerium and combined sulphur in the reaction produce approached the composition of the compound CeS, although oxygen was also present in it in the form of low valency cerium oxides and some carbon as well, the sum of O + C amounting to 3 - 4 %. To obtain CeS free from these impurities it was necessary to repeat the heating of the impure product with the addition of some more Ce_2S_3, the amount of Ce_2S_3 excess approximately equalling 70 %/b.w. of the invariably used Ce_2S_3. To determine the optimum of Ce_2S_3 excess the reaction product, of composition: $Ce_{gen.}$ — 82 %; $S_{comb.}$ — 15.0 %; free S - 0.1 %; C - 1.7 % and O (from difference) - 1.8 %, was reheated with 10-80 % of Ce_2S_3 (calculated on initially used). The results show that CeS with the least impurity amounts was formed by adding

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Vacuo-thermic method of ...

70 % Ce_2S_3 excess. This excess may be added during the first reaction which may then proceed in one step only; but it has been found that better results were obtained when, after one hour heating at 1650°C, the reaction product was ground and reheated. Investigating the applicability of the above method for preparing LaS, the authors found that Lanthanum monosulphide of stoichiometric composition was formed without any La_2S_3 excess. But twofold heating at 1650°C was needed in that case also, with an inter-grounding of the first obtained product. Both monosulphides are of golden-yellow color and their lattice indices were in agreement with data given in tabulating. There are 1 figure, 1 table and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The references to the English language publications read as follows: F. McTaggart, Austral. J. Chem., 2, 471, 1958; E. Eastman, L. Brewer, A. Bromley, P. Gilles, N. Lofgren, J. Amer. Chem. Soc. 72, 2248, 1958.

Card 4/5

27335
S/021/61/000/002/012/013
D210/D303

Vacuo-thermic method of ...

ASSOCIATION: Institut metalokeramiky yi spetssplaviv AN URSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR)

PRESENTED: by Member of AS UkrSSR, Yu.K. Delimars'kyyi

SUBMITTED: May 23, 1960

Card 5/5

S/700/61/000/006/001/018
D217/D304

AUTHOR: Samsonov, G. V.

TITLE: High-temperature compounds, their properties, manufacture and role in modern technology

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov. Seminar po zharostoykim materialam. Kiyev, 1960. Trudy no. 6: Khimicheskiye svoystva i metody analiza tugoplavkikh soyedineniy. Kiyev, Izd-vo AS UkrSSR, 1961, 5-29

TEXT: The main physical and mechanical properties of the technologically most important high temperature compounds are reviewed. Alloys based on these materials can be conveniently classified under the following groups: (1) Refractory materials; (2) chemically stable alloys; (3) fire and heat resistant alloys; (4) hard, super-hard and other tool materials; (5) electrical and radiotechnical materials. The above materials are almost exclusively manufactured by powder metallurgical methods. Extension of the manufacture and

Card 1/3

application of high melting point compounds necessitates the development of methods of chemical analyses of such compounds of various degrees of purity, and of complex compositions consisting of high melting point metalloid and non-metallic compounds. The development of methods of decomposition, separation and determination of the components of high melting point compounds and their alloys is a difficult problem, for whose solution close collaboration between technologists and chemical analysts is necessary. A large number of specialized chemical laboratories will be involved and a wide exchange of experience between chemists working in this new and important field, will be required. There are 14 figures, 8 tables and 34 references: 27 Soviet-bloc and 7 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: E. Reed, J. Am. Cer. Soc., 34, 146, 1954; J. Collins and R. Gerby, J. Metals, Sect. I, 7, 612, 1955; K. Taylor, Ind. and Eng. Chemistry, 47, 2506, 1955; H. Reed, F. Roe, H. Schroeder and W. Wroten, Ind. and Eng. Chemistry, 47, 2513, 1955.

35050
S/700/61/000/006/003/018
D217/D304

15.2240

AUTHORS: Kosolapova, T. Ya. and Samsonov, G. V.

TITLE: Chemical properties and methods of analysis of chromium carbides

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov. Seminar po zharostoykim materialam. Kieyev, 1960. Trudy no. 6: Khimicheskiye svoystva i metody analiza tugoplavkikh soyedineniy. Kieyev, Izdvo AS UkrSSR, 1961, 38-44

TEXT: The behavior of powdered and compacted specimens of various chromium carbides was studied in various chemical media at room temperature and on heating. The stability of the carbides at room temperature was studied by treating 0.2 g samples with 50 ml solvent for 48 hours. The insoluble portion was filtered off, dried and weighed, and the chromium content of the solution was determined. High-temperature treatment with acids and acid mixtures, as well as with solutions of alkalis was carried out whilst heating

Card 1/2

0.5 g specimens in a flask provided with a condenser. The insoluble residue was filtered off and weighed. The chromium content of the solution was determined. It was found that the resistance of the carbides to the action of mineral acids, their mixtures and solutions of alkalis, decreases in the order Cr_3C_2 - Cr_7C_3 - $Cr_{23}C_6$, this behavior being associated with their crystal structure. Their resistance increases in the presence of oxidizing agents. Oxidation of all the carbide powders commences at 700°C and the laws of oxidation for the various carbides are different. Compacted specimens of Cr_3C_2 and $Cr_{23}C_6$ remain practically unoxidized up to 1100°C. A method for determining the free carbon content of the chromium carbides was developed. This was based on the oxidation resistance of the latter. There are 8 tables and 10 references: 7 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: J. Leahe, Metallurgia, 45, 98, 1952; K. Kelley, F. Boericke, G. Moore, E. Huffman and W. Bangert, Techn. Report, No. 662, 1944.

35054
S/700/61/000/006/009/018
D267/D304

18.1200

AUTHORS: Samsonov, G. V., Vereykina, L. L. and Popova, O. I.

TITLE: Investigating chemical stability and methods of chemical analysis of Ti-P and Cr-P alloys

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nakh splavov. Seminar po zharostoykim materialam. Kiyev, 1960. Trudy no. 6: Khimicheskiye svoystva i metody analiza tugoplavkikh soyedineniy. Kiyev, Izdvo AS UkrSSR, 1961, 75-79

TEXT: The monophosphides (TiP and CrP) were prepared by passing PH_3 over heated metal powder under O-free argon. The phosphine was obtained by the acid decomposition of AlP. To obtain TiP it is recommended carrying out two 6-hour phosphidizations at 1000°C, and for obtaining CrP -- a single 7-hour phosphidization at 850°C. The reactions proceed faster when metal hydrides are substituted for the metals. After 10 - 12 hours' boiling, $TiP_{0.96}$ was found to be

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Investigating chemical stability ...

soluble in HF (40%) + HNO_3 (conc.) and in aqua regia, but not in H_2SO_4, HNO_3, HCl, HF (40%), HNO_3 + H_2O_2, NaOH (also with H_2O_2 or with Br water), or in H_2SO_4 + HNO_3. The results are tabulated. When Ti or Cr phosphides were fused with NaOH + Na_2O_2 or NaOH + Na_2CO_3, a loss of P took place. It was, therefore, necessary to develop an acidic method of decomposition of the phosphides. TiP was dissolved in HF (40%) + HNO_3 (conc.) mixture and the solution was slightly evaporated. To prevent the hydrolysis of Ti salts 30 ml of 35% tartaric acid solution was added; also a small quantity of dry H_3BO_3 to combine F ions. The fomula of the phosphide varied from $TiP_{0.74}$ (700°C, 3 hours) to $TiP_{0.97}$ (950°C, 6 hours). As regards CrP, it was found that the following acids dissolved it after a boiling of 6 - 8 hours: H_2SO_4 (also with HNO_3 or NH_4 persulfate), HF (40%), HCl (conc.), HCl (1:1), aqua regia; also NaOH (60%) + H_2O_2. It re-

Card 2/3

SAMSONOV, G.V.

M.V.Lomonosov and the science of metallurgy. Porosh.met. 1 no.6:5-9 N-D '61. (MIRA 15:5)

1. Chlen-korrespondent AN UkrSSR.
(Lomonosov, Mikhail Vasil'evich, 1711-1765)
(Metallurgy)

L'VOV, S.N.; NEMCHENKO, V.F.; SAMSONOV, G.V.

Heat conductivity of high-melting borides, carbides, and nitrides. Porosh.met. 1 no.6:70-74 N-D '61. (MIRA 15:5)

1. Khersonskiy gosudarstvennyy pedagogicheskiy institut imeni N.K.Krupskoy i Institut metallokeramiki i spetsial'nyk splavov AN UkrSSR.

(Borides—Thermal properties)
(Carbides—Thermal properties)
(Nitrides—Thermal properties)

S/081/62/000/003/048/090
B156/B101

1.1600

AUTHORS: Samsonov, G. V., Koval'chenko, M. S.

TITLE: Certain rules for the sintering of high-melting compound powders

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 3, 1962, 371-372, abstract 3K187. (Poroshk. metallurgiya, no. 1, 1961, 20-29)

TEXT: The behavior of the powders of high-melting nonplastic compounds during compression is investigated. It is shown that the compacting process is governed by the same laws as are effective with metal powders, the elasticity effect being greater, while there are breaks in the pressure dependence associated with the great brittleness and lack of plasticity of these metal-like compounds. Investigation of the sintering of compacts of high-melting compounds has shown that the density developed after holding isothermally is practically constant, the explanation lying in cessation of the process of creep. Sintering of high-melting compound powders with hot pressing has been investigated, the first stage of rapid shrinkage being accompanied by compacting due to deformation of particles, and by

Card 1/2

Certain rules for the sintering ... S/081/62/000/003/048/090
B156/B101

simultaneous recrystallization resulting in the shrinkage process being retarded. The phenomenon of expansion when the external pressure is removed during hot pressing is investigated, and the relaxation time for this process, a time which decreases by exponential law as the temperature rises, is determined. [Abstracter's note: Complete translation.]

B

Card 2/2

KISLYY, P.S.; LAKH, V.I.; SAMSONOV, G.V.; STADNYK, B.I.; KHARENKO, R.F.; CHEKHOVICH, A.B.

Thermoelectric characteristics of high-temperature thermocouples with refractory electrodes. Izm.tekh. no.5:21-23 My '61. (MIRA 14:5)

(Thermocouples)

34520
S/659/61/007/000/007/044
D217/D303

18.1200

AUTHOR: Samsonov, G.V.

TITLE: Investigating the properties of high melting point compounds in connection with their use as constituents of high temperature alloys

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam, v. 7, 1961, 58 - 77

TEXT: Due to the unsatisfactory properties of metals and metallic alloys, various high melting point compounds find an ever-increasing application in structures designed for high temperature operations. These are first of all carbides, borides, nitrides and silicides of metals and some non-metals. Apart from their high melting points (up to 3900°C for some compounds and up to 4200°C for their alloys), these compounds soften at much higher temperatures than metallic alloys and their degree of softening is much lower. Their disadvantages include their low resistance to thermal shock and their bad machinability. The properties of the high melting point

Card 1/3

Investigating the properties of ...

compounds and their alloys at high temperatures were investigated. The U.T.S. in compression is shown in a figure as well as the dependence of U.T.S. in compression on porosity at various temperatures for specimens of molybdenum disilicide. Non-metallic compounds (carbides and particularly boron and silicon nitrides) are characterized by a high thermal stability which is close to that of metals and metallic alloys. Therefore, boron and silicon nitrides can be used advantageously as additions to boride, nitride, etc. alloys in order to increase their thermal stability. In order to ensure a high thermal stability for boride-base alloys, not less than 15 % boron or silicon nitride should be added. The coefficient of thermal expansion is an important property for the application of high melting point compounds and their alloys, particularly under conditions of frequent and abrupt heat changes. It was found that titanium, hafnium and tantalum boride, tungsten carbide, silicon nitride, as well as a series of high melting point compounds, particularly silicon carbide - molybdenum silicide and silicon carbide - boron alloys, possess the least coefficients of thermal expansion. These alloys are characterized by a high heat resistance. In order

X

Investigating the properties of ... S/659/61/007/000/007/044
D271/D303

to assess the suitability of high melting point compounds, as materials for high temperature service in vacuo, their vapor pressure and rate of evaporation at high temperatures must be known. In view of the scarcity of data available, the author carried out appropriate measurements. The thermal and electrical conductivity, radiation coefficient and resistance to scale formation were studied. It was found that additions of molybdenum or tungsten silicide impart the greatest resistance against oxidation to silicon borides, carbides and nitrides. A technical classification of alloys of high melting point compounds is given and the technological peculiarities of the manufacture of articles from high melting point compounds and their future applications are discussed. There are 5 figures, 11 tables and 30 references: 24 Soviet-bloc and 6 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: Graham, Mechanical Design, 26, 159, 1954; Materials and Methods, 43, 131, 1956; G. Ault and G. Deutsch, J. Metals, First Section, 6, 1954; C. Uyers and A. Searcy, J. Amer. Chem. Soc., 79, 526 1957.

Card 3/3

X

24741

S/131/61/000/007/003/003
B105/B206

21.2100
15.2630

AUTHORS: Samsonov, G.V., Yasinskaya, G.A. and Shiller, E.A.

TITLE: Interaction of some oxides and carbides with difficultly fusible metals at high temperatures

PERIODICAL: Ogneupory, no. 7, 1961, 335-338

TEXT: This article gives the investigation results of the contact interaction of BeO, MgO, ZrO_2 and the carbides MeC (Me = zirconium, hafnium, niobium or tantalum) with niobium, molybdenum and tungsten at temperatures of up to 2100°C. Chemically pure beryllium- and magnesium oxide, zirconium dioxide, stabilized by means of calcium oxide, zirconium-, hafnium-, niobium- and tantalum carbides of stoichiometric composition, as well as difficultly fusible industrial metals were used. To investigate the contact interaction, an oxide and carbide ring respectively was pressed on a sample from difficultly fusible metal and the heated in a vacuum furnace to 1000 - 1600 - 2100°C for 0.5 to 5 hr. The fronts were then ground, polished and submitted to a metallographic investigation of the ground section obtained, the results of which are mentioned in Table 1.

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The interaction of zirconium-, hafnium-, niobium- and tantalum carbide with molybdenum at temperatures from 1000-2100°C and a heating time of 0.5, 1.0, 2.0, and 5.0 hr is investigated in a similar way. It is finally stated that tungsten shows the highest stability in contact with BeO, molybdenum and tungsten in contact with MgO, and molybdenum in contact with the stabilized zirconium dioxide. Tantalum carbide shows the highest stability in contact with molybdenum up to 2100°C. The interaction of molybdenum with zirconium-, hafnium-, and niobium carbides begins at 1800-2000°C. There are 1 figure, 2 tables, and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc. The three references to English-language publications read as follows: G. Economos, W. Kingery, Journ. Amer. Cer. Soc., 1953, No. 12, v. 36; W. Lidman, H. Hamijan, Journ. Amer. Cer. Soc., 1952, v. 35; P. Johnson, Journ. Amer. Cer. Soc., 1950, v. 33, No. 5.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR
(Institute of Powder Metallurgy and Special Alloys AS UkrSSR)

S/131/61/000/008/002/002
B105/B206

AUTHOR: Samsonov, G. V.

TITLE: Conference on Production and Use of High-melting Compounds of Rare Elements

PERIODICAL: Ogneupory, no. 8, 1961, 385 - 386

TEXT: A Conference on Production and Use of High-melting Compounds of Rare Elements was held in Moscow from May 4 to 5, 1961. It was arranged by the Giredmet, Gosudarstvennyy institut redkikh metallov (State Institute of Rare Metals) and the Institut metallokeramiki i spetsial'nykh splavov IMSS AN USSR (Institute of Powder Metallurgy and Special Alloys IMSS AS UkrSSR). The Conference was attended by delegates of more than 50 organizations and plants. An essential part of the reports and communications dealt with new highly refractory materials on the basis of high-melting compounds of rare metals, i. e., carbide borides, nitrides, silicides, oxides, and their alloys. The following reports are mentioned: G. V. Samsonov (IMSS AS UkrSSR) characterized the main physical properties of high-melting compounds of rare metals. The good refractory properties of zirconium boride,

molybdenum silicide, titanium and zirconium carbides, as well as of cerium sulfides were pointed out. Protective casings of thermocouples made from zirconium boride, developed by the IMSS AS UkrSSR jointly with the Institut avtomatiki Gosplana USSR (Automation Institute of the State Planning Commission of the Ukrainskaya SSR), permit continuous measurements of the steel temperature in the open-hearth furnace at 1600 - 1700°C during the entire melting process, of the crude iron in the converter and the pouring ladle, and during tapping of the furnace. The end pieces of thermocouples made from molybdenum disilicide permit continuous temperature control of oxidation gas media up to 1700 - 1800°C. Three main types of thermocouples are proposed at present: ПТ-1 (PT-1) with thermoelectrodes from molybdenum disilicide and tungsten for the measurement of temperatures in an oxidizing gas up to 1700°C; ПТ-2 (PT-2) for temperature measurements of molten steels, cast iron, nonferrous and rare metals and their alloys up to 2000°C; ПТ-3 (PT-3) for temperature measurements up to 2500°C in reductive and neutral gas media and in vacuo. G. A. Yasinskaya (IMSS AS UkrSSR) spoke about investigations of the refractory properties of high-melting compounds which are very stable against molten metals, slags, and salts. M. S. Koval'chenko (IMSS AS UkrSSR) reported on important technological methods

for molding and sintering refractory and other products of high-melting compounds of rare metals. T. Ya. Kosolapova (IMSS AS UkrSSR) outlined the demand of Soviet industry for refractory products made from high-melting compounds. P. S. Kislyy, T. N. Nazarchuk, and V. S. Fomenko characterized some applications of high-melting compounds in metallurgy, chemical industry, and radioelectronics. G. V. Lashkarev reported on the prospects of utilizing high-melting compounds for producing components of installations for the direct conversion of thermal into electric conversion. The development of the production of high-melting compounds at the Stalinskiy ekonomicheskiy rayon (Stalino Economy rayon) and Zaporozhskiy ekonomicheskiy rayon (Zaporozh'ye Economy rayon) was also reported. Of great interest were reports on the use of zirconium-containing materials in the production of electrically melted refractory products for the glass and metallurgical industries and on the investigation of reactions of oxides of rare elements and rare-earths elements with other oxides. The delegates underlined the great importance of new refractory materials for solving urgent problems in industry, and the theoretical and practical interest of the reports. A number of concrete measures for increasing research and developing production of high-melting materials on the basis

Conference on Production of ...

of rare-metal compounds were outlined in resolutions of the Conference.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys, AS UkrSSR)

Card 4/4

28690
S/021/61/000/009/008/012
D274/D304

26,2532

AUTHORS: Lashkar'ov, G.V., and Samsonov, G.V., Corresponding Member AS UkrSSR

TITLE: Characteristics of refractory compounds of transition metals as materials for thermoelectric converters

PERIODICAL: Akademiya nauk UkrSSR. Dopovidi. no. 9, 1961, 1148-1150

TEXT: The quality factor $z=\alpha^2/\varkappa\rho$ of refractory compounds is roughly calculated, as well as the efficiency η_T (corresponding to it) for the case of the hot joint being at a temperature T_1-1200°K and the cold joint at T_0=400°K; (α is the thermal e.m.f.-coefficient, $\varkappa$ - the heat-conductivity coefficient, ρ - the resistivity). The choice of T_1 is related to the use of cheap natural gas as the thermal-energy source. It is expected to raise the working

Card 1/3

temperature which would lead to higher efficiency. The efficiency was calculated by the formula

$$\eta_T = \eta_{TD}^N \qquad (1)$$

where η_{TD} is the thermodynamic efficiency of the motor and N denotes the lowering in efficiency as a result of heat losses; η_T was calculated for the case of optimum ratio M of load resistance to thermogenerator resistance. A graph shows the dependence of η_T on z. A table gives the values of α, ρ, $\varkappa$, η, z and zT_{max} (T_{max} being the highest possible temperature of the hot joint) for the following refractory compounds of transition metals: $MoSi_2$, CoSi, $NbSi_2$, ReSi, CrN, NbB_2, TiC, MnSi, $MnSi_2$,

Card 2/3

Characteristics of refractory ...

$ReSi_2$, and $CrSi_2$. Silicides like MnSi, $MnSi_2$ and $ReSi_2$ have a high efficiency, thus, e.g., MnSi has η = 13.1%. The carbides and borides (except for strontium hexaboride) of transition metals do not have a high η. It is noted that a series of refractory compounds with semiconductor properties exist which have a large thermal e.m.f., but at the same time high resistivity (sulfides of transition metals, barium silicide, etc.); hence they cannot be used in thermal-energy converters. CrN is the only nitride of transition metals which has a large thermal e.m.f. Its efficiency is 2%. There are 1 figure, 1 table and 9 references: 8 Soviet-bloc and 1 non-Soviet-bloc (in translation).

ASSOCIATION: Instytut metalokeramiky i spetsial'nykh splaviv AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrSSR)

SUBMITTED: February 13, 1961

Card 3/3

30316

S/115/61/000/010/005/005
E073/E535

245500

AUTHORS: Samsonov, G.V., Kislyy, P.S. and Panasyuk, A.D.

TITLE: Thermoelectric properties of thermocouples with high melting point solid electrodes

PERIODICAL: Izmeritel'naya tekhnika, no.10, 1961, 32-34

TEXT: ZrC and ZrB_2 have the favourable combination of high strength, low electric resistance, good thermal conductivity, moderate coefficients of thermal expansion and a high resistance against the effect of aggressive media, including molten metals and slags. The authors describe the results of investigations of the thermoelectric properties of thermocouples with electrodes made of these materials. The following electrode compositions were used: 1) virtually stoichiometric ZrB_2 with a free carbon admixture of approximately 0.4%; 2) ZrC containing 85.1% Zr, 12.8% C total (1.62% free C), and 0.05% Fe; and 3) ZrC of the same composition as above after separation of the free carbon by means of a 2% soap solution. From these materials thermoelectrode specimens were prepared and coupled with platinum. Their thermal e.m.f. was determined after treatment for 10 and 20 hours at high

Card 1/2

Thermoelectric properties of ...

30316
S/115/61/000/010/005/005
E073/E535

temperatures in H_2 and $CO + H_2$ media. The presence of free carbon sharply affects the stability of the thermal e.m.f. of ZrC. Determination of the variation with temperature of the thermal e.m.f. of ZrB_2 and ZrC showed that in a thermocouple with ZrC or ZrB_2 electrodes a virtually linear relationship exists between temperature and thermal e.m.f. ($\sim$ 8,7 $\mu V/°C$). Thermocouples based on these materials have only slight thermal e.m.f. fluctuations. The thermocouple was calibrated against another thermocouple in the temperature range 20 to 1200°C and by means of an optical pyrometer in the temperature range 800 to 2000°C. A graphite heater of a design which is illustrated in the paper was used; this enabled calibration up to 3000°C. The stability of the calibration curve was checked by holding the thermocouple at 1800°C in a hydrogen atmosphere. Subsequent re-calibration at 500, 1000, 1500 and 2000°C showed that at 2000°C the change did not exceed 25°C, i.e. it was of the order of 1%. There are 4 figures, 2 tables and 6 references: 5 Soviet and 1 non-Soviet.

Card 2/2

21360
S/021/61/000/011/008/011
D299/D304

15.2240

AUTHORS: Koval'chenko, M. S., and Samsonov, G. V., Corresponding Member AS UkrRSR

TITLE: NbC-C section of the diagram of Nb-C system

PERIODICAL: Akademiya nauk UkrRSR. Dopovidi, no. 11, 1961, 1478-1480

TEXT: The specimens were prepared of a mixture of NbC (with 11.1% Nb) and pure anthracene black, by hot-pressing at temperatures of 2950-2980°C. The carbon content in the alloys varied between 2 and 95%. The alloys with higher carbon content had a very porous structure. The specimens underwent a metallographic investigation. The eutectic melting point of the system NbC-C was found to lie between 2950-3000°C. A table lists the measured values of the melting point as well as the corrected values (for losses by radiation etc.). On this basis, a tentative diagram of the NbC-C section is constructed. It is noted that the melting point of NbC which was found to be at 3500°C, agrees well with the results of other in-

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vestigators. The section NbC-C is of eutectic type, which agrees with the results of M. Nadler, C. Kempter (Ref. 4: J. Phys. Chem., 64, 10, 1471, 1960); the eutectic melting point is, however, by approximately 200°C lower than that found in Ref. 4 (Op. cit.). A certain solubility of carbon in NbC was established on the basis of experiments with the specimens of low carbon content. The NbC-C eutectic, with melting point between 2950-3000°C is considerably lower than the TaC-C eutectic; it also corresponds to a considerably higher carbon content than does the eutectic of the TaC-C system. There are 2 figures, 1 table and 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: E. Storms, N. Krikorian, J. Phys. Chem., 64, 10, 1472, 1960; M. Nadler, C. Kempter, J. Phys. Chem., 64, 10, 1472, 1960.

ASSOCIATION: Instytut metalokeramiky i spetsial'nykh splaviv AN USSR (Institute of Powder Metallurgy and Special Alloys AS UkrRSR)

SUBMITTED: May 24, 1961

S/137/61/000/012/060/149
A006/A101

AUTHORS: Koval'chenko, M.S., Samsonov, G.V.

TITLE: Application of the theory of viscous flow to powder sintering by hot pressing

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 12, 1961, 45, abstract 12G318 ("Poroshk. metallurgiya," 1961, no. 2, 3 - 13, English summary)

TEXT: The authors employ Ya.I. Frenkel's method to describe the sintering process and take into account changes in the viscosity with decreasing porosity. A relationship is obtained for changes in porosity during hot pressing. This relationship is qualitatively confirmed by experimental results of hot pressing of glass and W and Cr carbides. In the latter case changes in viscosity as a result of grain growth were taken into account. The viscosity factors of these carbides at high temperatures were estimated. There are 21 references.

R. Andriyevskiy

[Abstracter's note: Complete translation]

Card 1/1

41346

S/081/62/000/017/017/102
B166/B180

18 2100

AUTHOR: Samsonov, G. V.

TITLE: Thermophysical properties of alloys in the systems boron - nitrogen, boron - carbon, silicon - nitrogen, boron - silicon - carbon

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 17, 1962, 47-48, abstract 17B320 (Poroshk. metallurgiya, no. 3, 1961, 53 - 62 [summary in Eng.])

TEXT: The electrical resistivity and thermo emf were studied in alloys in the B - N, B - C, Si - N, B - Si - C systems, which were prepared by the powder-metallurgy method. A sudden rise in electrical resistivity is observed in the B-N system when the N content is increased to 35 - 38%. The electrons forming the bond between the flat atomic layers in the structure of the boron nitride are the main source of current carriers. At room temperature silicon nitride has a resistivity of 10^{13} - 10^{14} Ω/cm and a forbidden band of 3.9 - 4.0 ev; at 300°C the resistivity is $2 \cdot 10^{8}$ Ω/cm. A new carbide $C_{12}C$ was discovered, and therefore the diagram of the B - C

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S/081/62/000/017/017/102
B166/B180

Thermophysical properties ...

system published earlier (RZhKhim, no. 8, 1959, 26426) was corrected. The gap energy for B_4C is 1.64 ev. In the B - Si - C system there are alloys with high thermo emf, reaching values of 500 - 600 μv/deg. [Abstracter's note: Complete translation.]

Card 2/2

36428
S/137/62/000/003/061/191
A006/A101

21.2110
15.2240

AUTHORS: Verkhoglyadova, T. S., Dubovik, T. V., Samsonov, G. V.

TITLE: Nitration of transition metal powders with the formation of nitride phases

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 40, abstract 3G277 ("Poroshk. metallurgiya", 1961, no. 4, 9 - 20, English summary)

TEXT: The authors studied kinetics of nitration of Ti, Zr, V, Nb, Ta, Mo, Cr and Re powders at 500 - 1,200°C. On the basis of X-ray and chemical analyses of the compounds obtained, the optimum nitration conditions were established. The constants of the rate and activation energy of nitration were calculated from kinetics of overweight of the reaction products. For nitrides of Ti and Zr, V(VN), Nb(NbN), Ta(TaN), Cr(Cr_2N), the optimum nitration temperature is 1,200°C; for V_3N, Nb_2N, Ta_2N, CrN it is 900°C; for Mo_2N - 700°C and for Re_3N it is 300 - 350°C.

R. Andriyevskiy

[Abstracter's note: Complete translation]

Card 1/1

S/137/62/000/004/046/201
A006/A101

1.1600

AUTHROS: Koval'chenko, M.S.; Samsonov, G.V.

TITLE: Viscous flow in sintering zirconium boride powder by hot pressing

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 42, abstract 4G279 ("Poroshk. metallurgiya", 1961, no. 5, 3 - 9, English summary)

TEXT: The authors evaluated the effect of capillary pressure on shrinkage in hot pressing. Zr boride was pressed at 2,100 - 2,300°C under a pressure of 58.6 - 114 kg/cm^2 for up to 20 min. From experimental data the authors determined values of the viscosity coefficient and disintegration energy of ZrB_2 (57.5 kcal/mole).

R. Andriyevskiy

[Abstracter-s note: Complete translation]

Card 1/1

S/137/62/000/004/045/201
A006/A101

15.2240

AUTHORS: Rekov, A.I.; Samsonov, G.V.

TITLE: Carbothermal method of producing boron carbide in coreless furnaces

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 42, abstract 4G275 ("Poroshk. metallurgiya", 1961, no. 5, 80 - 91, English summary)

TEXT: B_4C powder is widely used in the production of various articles and for grinding operations. The authors analyze the deficiencies of existing methods for obtaining B_4C by arc melting, such as high temperature, uneconomical operation, contamination of the product. A scheme is described for obtaining B_4C by reduction of B_2O_3 with carbon black in coreless electric furnaces (the current is passed through a compact charge layer). This method is considerably more economical than arc melting and makes it possible to prepare B_4C of high purity (75.2 - 77.6% B, 20 - 21% C_{total}, 0.6 - 0.8% C_{free}). There are 13 references.

R. Andriyevskiy

[Abstracter's note: Complete translation]

Card 1/1

S/137/62/000/007/018/072
A052/A101

AUTHORS: L'vov, S. N., Nemchenko, V. F., Samsonov, G. V.

TITLE: The heat conductivity of refractory borides, carbides and nitrides

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 7, 1962, 45, abstract 7G316 ("Poroshk. metallurgiya", no. 6, 1961, 70 - 74; English summary)

TEXT: An installation for determining the heat conductivity by a stationary method is described. The heat conductivity values of borides, carbides and nitrides of a number of transition metals are specified. The porosity of the samples was eliminated according to the additivity rule. The Wiedemann-Franz ratio for refractory compounds has about the same order as for metals, with the exception of Nb monomitride, Mo seminitride and Cr nitride. The heat conductivity characteristics of refractory compounds are discussed in connection with their structure. There are 15 references.

R. Andriyevskiy

[Abstracter's note: Complete translation]

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20962
S/192/61/002/002/002/002
B130/B205

15.2220 1273, 1142, 1043

AUTHORS: Paderno, Yu. B. and Samsonov, G. V.

TITLE: Thulium borides

PERIODICAL: Zhurnal strukturnoy khimii, v. 2, no. 2, 1961, 213-214

TEXT: A study has been made of the preparation of thulium borides by reduction of thulium oxide with boron. The great advantage of this method is that products of higher purity are obtained. X-ray phase analysis of powdery substances obtained between 1600 and 1900°C indicated the formation of a two-component mixture (thulium hexaboride and thulium tetraboride) having the characteristic structure of rare-metal borides. Data of the X-ray picture of the product obtained at 1900°C are collected in Table 1. For thulium hexaboride a = 4.102 kX (cubic lattice), and for thulium tetraboride a = 7.04, and c = 3.98 kX (tetragonal lattice). Similar results are obtained when preparing dysprosium, holmium, and lutecium melts with boron. The formation of TuB_6 is difficult on account of the high ionization potential of Tu. There are 1 figure, 1 table, and

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Thulium borides

S/192/61/002/002/002/002
B130/B205

5 Soviet-bloc references.

ASSOCIATION: Institut metallokeramiki i spetsial'nykh splavov AN USSR (Institute of Powder Metallurgy and Special Alloys of the AS UkrSSR)

SUBMITTED: January 15, 1960

Card 2/3

SAMSONOV, G.V.; VERKHOGLYADOVA, T.S.

Hardness of transition metal nitrides. Zhur.strukt.khim. 2 no.5:617-618 S-O '61. (MIRA 14:11)

1. Institut metallokeramiki i spetsial'nykh splavov AN USSR. (Nitrogen alloys) (Hardness)